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Science and Technology for Tomorrow's Air and Space Force



Success Story

VIBRATION ISOLATION SYSTEM ENABLES AIRBORNE LASER



The airborne laser (ABL) is expected to be the Air Force's first operational fielded directed energy weapon system. The ABL will provide theater missile defense to protect US troops anywhere in the world. The ABL would not perform as required without a system for controlling dynamic vibration and precise registration of multiple optical benches. Under a Small Business Innovation Research (SBIR) Phase II contract, the Space Vehicles Directorate and CSA Engineering designed, built, and tested an airborne suspension/vibration isolation system.



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Accomplishment

The directorate and CSA Engineering developed an isolation system that stabilizes and aligns the resonator optics of the ABL segment, the primary component of the system. The innovative system comprises frictionless, ultrasoft air springs and high-performance magnetic actuators. The result is extremely precise position control coupled with an ultrasoft ride for ABL optics, an unprecedented achievement in meeting such competing requirements. The isolation system solves the critical issue of providing multiple, extremely stable platforms for sensitive laser optics during all possible flight conditions while operating in the presence of large laser-induced vibration, acoustic, and shock disturbances.

High-power laser technology from the directorate allows the system to fly a stable optical bench within the aircraft that can operate in a “real-world” environment. One of the most complex isolation systems ever built, it successfully demonstrates the advanced technology required to meet the stringent ABL requirement. The optical bench isolation system (OBIS) simultaneously meets the unprecedented requirements for rejecting the large unwanted vibrations affecting the system combined with the competing requirements for extremely precise registration of multiple optical benches spaced more than 50 ft apart in the ABL aircraft.

This successful SBIR Phase II project has transitioned to a \$6 million follow-on contract to build a ground demonstrator and the OBIS. The OBIS system will be a critical enabling component in future operational ABL and other directed energy systems.

Background

One of the most critical issues with ABL development has been the simultaneous stabilization, alignment, and vibration isolation of the laser segment resonator optics during flight. The requirements for rejecting unwanted vibration and the competing requirements for extremely precise registration of multiple optical benches in the ABL aircraft is unprecedented. The ABL will not operate properly without precise vibration control. The SBIR Phase II was arranged to solve this mission-critical problem.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (04-VS-03)

Space Vehicles
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